locities and mean *vis viva*. This is the foundation of Maxwell's theory of the equality of mean *vis viva* in the molecular movements of different gases at equal temperatures, and of Pfaundler's discovery that in estimating the heat of dissociation, the mean should be taken between the temperatures of incipient and of complete dissociation.

2. The projectile force, which produces flight or cyclical motion against any central acceleration or retardation, is equivalent to the mean acceleration or retardation multiplied by one-half the time of flight or cyclical motion.

3. The velocities of wave motion in elastic fluids, and of cosmical and molecular orbital motion, can all be expressed by the common formula $v = \sqrt{2\,gh}$.

4. Every periodic vibrating or orbital motion can be regarded as the sum of a certain number of pendulum vibrations. (*Fourier's theorem.*)

5. The distance of the centre of oscillation from the centre of relative stability is at two thirds of the length of a linear pendulum, or at the square root of four tenths of radius in a rotating sphere.

6. The acceleration of any force, which is uniformly diffused from or towards a given centre, varies inversely as the square of the distance from the centre.

7. Times of revolution under the action of such forces, vary as the three halves power of the distance; distances vary as the two thirds power of the time.

8. Centres of inertia, or nodes, in a vibrating elastic medium, tend to produce harmonic nodes.

9. The mutual inter-actions of cosmical, molecular or atomic bodies are proportioned to the respective masses; actions which are considered with reference to a single active centre vary directly as the mass and inversely as the square of the distance.

10. In elastic atmospheres the densities decrease in geometrical progression, as the height above the surface increases in the arithmetical progression.

11. Living force, or *vis viva*, is proportional to the product of mass by the square of the velocity.

12. The distance of projection against uniform resistance is proportioned to the living force.

13. In condensing nebulæ, the velocity of circular orbital revolution is acquired by subsidence, from a state of rest, through one-half of radius.

The following additional propositions may be readily deduced from the foregoing.

14. *Mean vis viva* may be represented by the *vis viva* of centres of oscillation.

15. The force of planetary projection should be referred to perihelion; the force of incipient subsidence, to aphelion.

16. In synchronous orbits, the mean velocity of rectilinear oscillation is to the velocity of circular orbital oscillation as twice the diameter is to the circumference.

17. The acceleration or retardation of a centripetal force varies as the fourth power of the velocity of orbital revolution.

18. In cyclical motions, the resultant of all internal forces must be in equilibrium with the resultant of all external forces, at the expiration of each half cycle.

19. The modulus of cyclical motion is equal to the product of mean acceleration by the square of the time of a half cycle.

20. The sum of all external forces may, therefore, be represented by a velocity which is equivalent to the mean or resultant internal force acting for one-half of the cyclical time.

21. The influence of a central force which acts at the extremity of a linear pendulum is nine times as great upon the centre of oscillation, as its influence upon the centre of suspension.

22. The limiting *vis viva* of wave propagation is five-ninths of the mean *vis viva* of the oscillating particles.

23. In condensing nebulæ, rupturing forces which are due to central subsidence may be represented by fractions in which the denominator is one greater than the numerator.

24. In synchronous rotation and revolution, the nucleal radius varies as the three-fourths power of the limiting atmospheric radius.

25. The variation in mean *vis viva* of gaseous volume is to the variation in *vis viva* of uniform velocity as 1 is to 1.4232.

26. The mean thermal and mechanical influences of the sun must be in equilibrium.

27. The collisions of particles, in subsiding towards a centre of force, tend to form belts at the centre of linear oscillation.

28. The limiting velocity between tendencies to aggregation and tendencies to dissociation is to the velocity in a circular orbit as the ratio of the circumference of a circle to its diameter is to the square root of two.

29. In explosive, as well as in cyclical motions, equilibrium must be established between internal and external forces.

30. Apsidal and mean planetary positions must also be controlled by like tendencies to equilibrium.

31. Undulations in an elastic medium maintain the primitive velocity which is due to their place of origination.

32. When two or more cyclical motions are combined, they must all be modified by the tendency to conservation of areas.

33. In expanding or condensing nebulæ, the conservation of areas maintains a constant value for the modulus of rotation.

34. Instantaneous action between different masses or particles, by mere material intervention, is impossible.

35. In synchronous motions about different centres, the mean distances from the centres of motion vary as the cube root of the masses or other controlling forces.

36. Constant velocities, in a homogeneous elastic medium, represent constant living forces.

37. The time of acquiring orbital velocity, at Laplace's limit of possible atmosphere, is to the time of acquiring "nascent" or dissociative velocity at the nucleal limit, as the diameter of a circle is to its circumference.

These laws are applicable in all branches of radiodynamics, viz.: photodynamics, thermodynamics, electrodynamics, cosmodynamics, chemical physics, hydrodynamics and pneumatics.

COMET C, 1881.

At 3 A. M., of the 14th instant, a comet was observed at Ann Arbor by Mr. J. M. Schaeberle, an amateur astronomer, who has the privilege of the University Observatory.

Mr. Henry M. Parkhurst, of Brooklyn, whose recent calculations on comet B, 1881, proved to be very accurate, has published in the New York *Herald* the following observations on Mr. Schaeberle's comet:

"The position of the new comet on the 20th instant at 2h. 46m., Washington mean time, was:—Right ascension, 5h. 54m. 58s.; North declination, 40 degrees, 40 minutes. This shows a motion of 29 minutes per day—an increase of 7 minutes—showing that the comet is not so distant as I had hoped. I have not succeeded in reconciling my two positions with that telegraphed for the time of discovery. To satisfy the right ascension given the comet must have already passed its perihelion and be moving in such an orbit that it will pass between the earth and sun within a fortnight, and be no more seen in this hemisphere. The increased brightness this morning tends to support this idea. Yet it may not have reached its perihelion; in which case it may be visible for a month longer. I shall be compelled to wait for a third accurate observation before I can determine the orbit more exactly. In any event the comet is coming directly toward the earth, and it will become much brighter than at present, so that it will probably be visible to the naked eye as soon as the moonlight ceases to interfere. It is now about 12 degrees southeast of Capella, the bright star in the northeastern sky at 3 o'clock in the morning."